

**9-16 FENCE AND GUARDRAIL****9-16.1 Chain Link Fence and Gates****9-16.1(1) General**

All material used in the construction of chain link fence and gates shall be new. Iron or steel material shall be galvanized unless specified otherwise. Material upon which serious abrasions of galvanizing occur shall not be acceptable.

**9-16.1(1)A Post Material for Chain Link Fence**

Except as noted otherwise, post material shall conform to the requirements of AASHTO M 181, Type I (zinc-coated steel), Grade 1 or 2, and shall be understood to include all round and roll-formed material (brace rails, top rails, line posts, brace posts, end posts, corner posts and pull posts).

Grade 1 post material shall conform to the weight per linear foot, minimum wall thickness and detail requirements of ASTM F1043. Grade 1 post material that exceeds the maximum wall thickness requirement of ASTM F1043 may be accepted, provided it does not interfere with the proper construction of the fence.

Grade 2 post material shall meet the organic exterior coatings requirements of AASHTO M 181 (Section 33) and the additional requirement that the interior coated surface shall be capable of resisting 300 hours of exposure to salt fog with a maximum of 5% red rust when tested in accordance with ASTM B 117.

- **Round Post Material**

Round post material shall be Grade 1 or 2.

- **Roll Form Material**

Roll-formed post material shall be Grade 1. Roll-formed end, corner, and pull posts shall have integral fastening loops to connect to the fabric for the full length of each post. Top rails and brace rails shall be open rectangular sections with internal flanges as shown in ASTM F1043.

**9-16.1(1)B Chain Link Fence Fabric**

Chain link fabric shall consist of 11 gage wire for Types 3, 4, and 6 fence, and 9 gage wire for Type 1 fence. The fabric shall be zinc-coated steel wire conforming to AASHTO M 181, Class C.

The wire shall be woven into approximately 2-inch diamond mesh. The width and top and bottom finish of the fabric shall be as specified in AASHTO M 181.

**9-16.1(1)C Tension Wire**

Tension wire shall meet the requirements of AASHTO M 181. Tension wire galvanizing shall be Class 1.

**9-16.1(1)D Fittings and Hardware**

Except where indicated, fittings shall be malleable cast iron or pressed steel and shall conform to the requirements of ASTM F626 or AASHTO M232, whichever is applicable. Fittings for any particular fence shall be those furnished by the manufacturer of the fence.

Tension truss rods shall be  $\frac{3}{8}$ -inch round galvanized rods with drop forged turnbuckles or other approved type of adjustment. Couplings for tubular sections shall be outside sleeve type and shall be at least 6-inches long.

Eye bolts for attaching tension wire shall be  $\frac{3}{8}$ -inch diameter and of sufficient length to fasten to the type of post being used.

Tension bars shall be  $\frac{3}{16}$ -inch by  $\frac{3}{4}$ -inch nominal and cross sectional area shall be  $0.141 \text{ in}^2 \pm 5\%$ .

Hog rings shall be 12 gage galvanized steel wire. Tie wire shall be 9 gage galvanized steel wire or 9 gage aluminum wire meeting the requirements of ASTM F626.

#### **9-16.1(1)E Chain Link Gates**

Gate frames shall be constructed of not less than  $1\frac{1}{2}$ -inch (I.D.) hot-dipped galvanized pipe conforming to AASHTO M 181 Type I, Grade 1 or 2 as specified in Section 9-16.1(1)A. The corners of the gate frame shall be fastened together and reinforced with a malleable iron or pressed steel fitting designed for the purpose, or they may be welded. Welding shall conform to the requirements of Section 6-03.3(25). All welds shall be ground smooth and painted with an A-9-73 or A-11-99 primer meeting the requirements of Section 9-08.2. The paint shall be applied in one or more coats to provide a minimum dry film thickness of 3.5 mils.

Chain link fence fabric for filling the gate frame shall meet the requirements of Section 9-16.1(1)B for the fence type being furnished.

Cross trussing shall be  $\frac{1}{16}$ -inch steel adjustable rods galvanized in accordance with Section 9-16.1(1)D.

Each gate shall be furnished complete with necessary hinges, latch, and drop bar locking device designed for the type of gate posts and gate used on the project. Gates shall have positive type latching devices with provisions for padlocking. Hinges, latches, and locking devices shall be galvanized in accordance with Section 9-16.1(1)D.

Gate frames constructed of steel sections, other than pipe, that are fabricated in such a manner as to form a gate of equal or better rigidity may be used provided they are approved by the Engineer.

#### **9-16.1(1)F Concrete**

All concrete for chain link fence shall be as specified in Section 6-02.3(2)B.

#### **9-16.1(2) Approval**

Approval of materials for chain link fence shall be by evaluation of independent test results from a certified testing laboratory or by QPL. Independent test results for evaluation shall be submitted to the State Materials Engineer in Tumwater WA.

### **9-16.2 Wire Fence and Gates**

#### **9-16.2(1) General**

All materials used in the construction of the wire fence shall be new. All iron or steel material shall be galvanized. Material upon which serious abrasions of galvanizing occur will not be acceptable.

**9-16.2(1)A Steel Post Material**

- **Round Post Material**

Round post material shall conform to AASHTO M 181, Type I, Grade 1.

- **Angle Post Material** (Channel, T, U, Y, or Other Approved Style)

All angle post material shall be hot-dipped galvanized in accordance with the requirements of AASHTO M 111 grade 75. Galvanizing shall be 1.7 oz/ft<sup>2</sup> of surface area. Angle post used for end, corner, gate and pull post and brace shall have a minimum weight of 3.1 lb/ft.

Posts shall be not less than 7-feet in length. A tolerance of -5% on the weight of individual posts, braces or anchor plates will be permitted. One type of line post shall be used throughout the project. Line posts shall be studded, slotted, or properly adapted for attaching either wire or mesh in a manner that will not damage the galvanizing of posts, wire or mesh during the fastening. Line posts shall have a minimum weight of 1.33 lbs/ft and shall be provided with a tapered galvanized steel anchor plate. The anchor plate shall be securely attached and have a surface area of  $20 \pm 2$  in<sup>2</sup>, a minimum weight of 0.67 pounds and 1.7 oz/ft<sup>2</sup> galvanizing.

**9-16.2(1)B Wood Fence Posts and Braces**

Douglas fir, Western red cedar, hemlock, or larch shall be used in the construction of wood fence posts and braces. The material shall be of good quality and approved by the Engineer before use. Peeler cores shall not be used for round posts. Wood fencing materials shall have sufficient sapwood in the outer periphery to obtain the specified penetration of preservative. Western red cedar will not require preservative treatment. Fencing materials shall be cut to the correct length before pressure treatment.

Line posts shall be 3-inch minimum diameter round posts or nominal 3-inch by 3-inch square sawed posts. If the posts are to be pointed for driving, they shall be pointed before treatment. Line posts shall be at least 7-feet in length.

Pull posts and brace posts shall be 6-inch diameter round posts or nominal 6-inch by 6-inch material not less than 7-feet in length.

End, gate, and corner posts, and posts at an intersecting fence shall be 6-inch diameter round posts or nominal 6-inch by 6-inch material not less than 7-feet 10-inches in length.

All sawed posts and timbers shall meet the requirements in the table under Section 9-09.2.

The preservatives used to pressure treat wood fencing materials shall meet the requirements of Section 9-09.3.

The retention and penetration of the preservative shall be as follows:

<b>Minimum Retention in Pounds Per Cubic Foot</b>		
<b>Preservative</b>	<b>Sawed Posts</b>	<b>Round Posts</b>
Creosote	10.00	8.00
Pentachlorophenol	0.50	0.40
ACA	0.40	0.40
ACZA	0.40	0.40
CCA	0.40	0.40

**Minimum Penetration**

for material 5" or less - 0.40-inches penetration and 90% of sapwood

for material 5" or greater - 0.50-inches penetration and 90% of sapwood

**9-16.2(1)C Brace Wire**

Brace wire shall be 9 gage wire galvanized to meet the requirements of AASHTO M 279, Type Z, Class 1.

**9-16.2(1)D Staples and Wire Clamps**

The staples used to attach the wire fencing to wood posts shall be 9 gage wire, 1½-inches long, galvanized to meet the requirements of AASHTO M 279, Type Z, Class 1.

The wire clamps used to attach the wire fencing to steel posts shall be 11 gage wire, galvanized to meet the requirements of AASHTO M 279, Type Z, Class 1.

**9-16.2(1)E Barbed Wire**

Barbed wire shall conform to the requirements of AASHTO M 280, Type Z and shall consist of two strands of 12½ gage wire, twisted with four point 14 gage barbs with barbs spaced 5-inches apart (Design 12-4-5-14R). Galvanizing shall be Class 3.

**9-16.2(1)F Wire Mesh**

Wire mesh shall conform to the requirements of AASHTO M 279, Type Z and shall consist of eight horizontal wires with vertical stays spaced 6-inches apart. The top and bottom wires shall be 10 gage, and the intermediate wires and vertical stays shall be 12½ gage. The mesh shall have a total width of 32-inches (Design 832-6-12½). Galvanizing shall be Class 3.

The zinc coated wire as represented by the test specimens shall be capable of being wrapped in a close helix at a rate not exceeding 15 turns/minute around a cylindrical steel mandrel having a diameter the same as the specimen being tested, without cracking or flaking the zinc coating to such an extent that any zinc can be removed by rubbing with the bare fingers.

**9-16.2(1)G Vertical Cinch Stays**

Vertical cinch stays shall be 10 gage galvanized wire meeting the requirements of AASHTO M 279, Type Z, Class 1.

**9-16.2(1)H Miscellaneous Hardware**

Bolts, nuts, hinges, latches and other miscellaneous hardware shall be galvanized in accordance with AASHTO M 232.

**9-16.2(1)I Wire Gates**

Gate frames shall be constructed of galvanized pipe with a nominal diameter of not less than 1-inch. The pipe shall conform to the requirements of AASHTO M 181 Type I, Grade 1. Wire gates shall be not less than 48-inches in height and shall be designed to fit openings of the width called for in the Plans or as indicated by the Bid items. Each gate shall be provided with two upright braces of the same material as the frame, spaced at ⅓ points in the gate. All gates shall be provided with adjustable ⅝-inch diameter galvanized diagonal truss rods from corner to corner. Galvanizing shall be in accordance with Section 9-16.2(1)H.

The gate frame shall be provided with wire mesh conforming to the requirements specified in Section 9-16.2(1)F, except that it shall consist of 10 horizontal wires and have a total width of 47-inches.

Each gate shall be furnished complete with necessary galvanized hinges and latch designed for use with the type of gate posts used on the project. The hinges shall be so designed as to be securely attached to the gate post and to enable the gate to be swing back against the fence. Double gates shall be hinged in the same manner as single gates and shall be provided with an approved galvanized drop bar locking device. Galvanizing for hinges, latches, and locking devices shall be in accordance with Section 9-16.2(1)H.

#### **9-16.2(1)J Concrete**

All concrete for wire fence shall be as specified in Section 6-02.3(2)B.

#### **9-16.2(2) Approval**

Approval of materials for wire fence shall be by evaluation of independent test results from a certified testing laboratory or by QPL. Independent test results for evaluation shall be submitted to the State Materials Engineer in Tumwater WA.

### **9-16.3 Beam Guardrail**

#### **9-16.3(1) Rail Element**

The W-beam or thrie beams rail elements, backup plates, reducer sections, and end sections shall conform to "A Guide to Standardized Highway Barrier Hardware" published by AASHTO, AGC, and ARTBA. All rail elements shall be formed from 12 gage steel except for thrie beam reducer sections, thrie beams used for bridge rail retrofits, and Design F end sections, which shall be formed from 10 gage steel.

The rail splices shall have a minimum total ultimate strength of 80,000 pounds at each joint.

The 6-inch channel rails and splice plates shall conform to ASTM A 36, except that the channel rails may conform to ASTM A 992. All fabrication shall be complete before galvanizing.

The holes in the plate shall be slotted to facilitate erection and to permit expansion and contraction. The edges of the rail shall be rolled or rounded so they will present no sharp edges. Where the rail is on a curve, the plates at the splice shall make contact throughout the area of splice. When the radius of curvature is less than 150-feet, the rail shall be shaped in the shop.

#### **9-16.3(2) Posts and Blocks**

Posts and blocks may be of creosote treated timber, pentachlorophenol treated timber, waterborne chromated copper arsenate (CCA), ammoniacal copper arsenate (ACA), or ammoniacal copper zinc arsenate (ACZA), treated timber or galvanized steel; except only treated timber posts and blocks may be used for weathering steel beam guardrail. Blocks made from alternate materials that meet the NCHRP Report 350 criteria may be used in accordance with the manufacturer's recommendations. Except for terminal or anchor assemblies, all posts for any one project shall be of the same type (wood or steel). Posts and blocks shall be of the size and length shown in the Plans and meet the requirements of these Specifications. Posts and blocks may be S4S or rough sawn.

Timber posts and blocks shall conform to the grade specified in Section 9-09.2, except pine lumber No. 1 grade may be used for the blocks. Timber posts and blocks shall be fabricated as specified in the Plans before being treated. Timber posts and blocks shall be treated by the empty cell process to provide a minimum retention, depending on the treatment used, according to the following:

Creosote oil	12.0 lbs. pcf.
Pentachlorophenol	0.60 lbs. pcf.
ACA	0.50 lbs. pcf.
ACZA	0.50 lbs. pcf.
CCA	0.50 lbs.pcf.

Treatment shall be in accordance with Section 9-09.3.

Steel posts, blocks, and base plates, where used, shall conform to either ASTM A 36 or ASTM A 992, and shall be galvanized in accordance with AASHTO M 111. Welding shall conform to Section 6-03.3(25). All fabrication shall be completed prior to galvanizing.

### 9-16.3(3) Galvanizing

Beam rail elements and terminal sections shall be galvanized in accordance with AASHTO M-180, Class A, Type 2, except that the rail shall be galvanized after fabrication, with fabrication to include forming, cutting, shearing, punching, drilling, bending, welding, and riveting. In addition, the minimum average mass of zinc coating shall be 2 ounces per square foot of surface (not sheet), the average to be determined on the basis of three individual tests, no one of which may be less than 1.8 ounces per square foot of surface (not sheet). The aluminum content of the zinc bath during actual galvanizing operations shall not exceed 0.01 percent. Channel rails, splice plates, WF steel posts, and base plates shall be galvanized in accordance with ASTM A 123. Anchor cables shall be galvanized in accordance with Federal Specification RR-W-410, Table II, galvanized at finished size. Bolts, nuts, washers, plates, rods, and other hardware shall be galvanized in accordance with ASTM A 153.

### 9-16.3(4) Hardware

Bolts, unless otherwise specified, shall comply with ASTM A 307 Grade A Specifications. High strength bolts shall conform to the requirements of AASHTO M 164. Nuts, unless otherwise specified, shall comply with ASTM A 563 Grade A Specifications. Washers, unless otherwise specified, shall meet ASTM F 844 Specifications. The Contractor shall submit a manufacturer's certificate of compliance for high strength bolts, nuts, and washers prior to installing any of the hardware. A307 Bolts will be accepted by field verification and documentation that bolt heads are stamped 307A.

### 9-16.3(5) Anchors

Welding shall conform to Section 6-03.3(25).

All welding shall be equal in strength to the parent metal.

All fabrication shall be complete and ready for assembly before galvanizing. No punching, drilling, cutting, or welding will be permitted after galvanizing unless authorized by the Engineer.

Foundation tubes shall be fabricated from steel conforming to the requirements of ASTM A 500, Grade B or ASTM A 501.



The anchor plate assembly shall develop a minimum tensile strength of 40,000 pounds.

The anchor plate, W8 x 18, and metal plates shall be fabricated of steel conforming to the Specifications of ASTM A 36, except that the W8 x 18 may conform to ASTM A 992.

Anchor cable shall be  $\frac{3}{4}$ -inch preformed, 6 x 19 wire strand core or independent wire rope core (IWRC), galvanized, right regular lay manufactured of improved plow steel with a minimum breaking strength of 42,800 pounds. Two certified copies of mill test reports of the cable used shall be furnished to the Engineer.

Swaged cable fittings shall develop 100 percent of the specified breaking strength of the cable. One swaged fitting attached to 3-feet of cable shall be furnished to the Engineer for testing.

The swaged fitting and stud assembly shall be of steel conforming to the requirements of American Iron and Steel Institute C-1035 and shall be annealed and galvanized suitable for cold swaging.

All metal components of the anchor and cable assembly and not less than the top 14-inches of the W8 x 18 for the Type 2 anchor shall be hot-dip galvanized in accordance with Section 9-16.3(3).

Cement concrete shall conform to the requirements of Section 6-02.3(2)B.

Cement grout shall consist of one part Portland cement and two parts sand.

#### **9-16.3(6) Inspection and Acceptance**

The Contractor shall give notice to the Engineer before the rail elements are fabricated in order that inspections may be provided. The Contractor shall arrange for all facilities necessary for the inspection of material and workmanship at the point of fabrication of the rail element, and inspectors shall be allowed free access to necessary parts of the premises.

The Inspector shall have the authority to reject materials or workmanship which do not fulfill the requirements of these Specifications. In cases of dispute, the Contractor may appeal to the Engineer, whose decision will be final.

The Inspector may accept a mill test report certifying that the steel used in fabricating the rail element meets the requirements of the Specifications. The Contracting Agency reserves the right, however, to require the Contractor to furnish samples of the steel proposed for use and to determine to its satisfaction that the steel meets the Specification requirements. Steel rail elements, fittings, end section hardware, and bolts may be accepted by the Engineer based on the Manufacturer's Certification of Compliance.

### **9-16.4 Wire Mesh Slope Protection**

#### **9-16.4(1) General**

All metal material used in the construction of wire mesh slope protection shall be new and galvanized. Imperfectly galvanized material or material upon which serious abrasion of galvanizing occurs will not be acceptable.

#### **9-16.4(2) Wire Mesh**

The galvanized wire mesh shall consist of No. 9 gage (0.148-inch diameter) commercial quality zinc coated steel wire, 3½-inches x 5½-inches diamond mesh chain

link conforming to the requirements of AASHTO M 181. Galvanizing shall conform to the requirements of ASTM A 392 except the weight of zinc coating shall be 0.80 ounce per square foot minimum, of uncoated wire surface. Galvanizing shall be done before weaving.

The wire mesh fabric shall have knuckled selvages.

Alternate wire mesh for slope protection shall be double twisted mesh. The mesh shall be of nonraveling construction and consist of a uniform double twisted hexagonal mesh of hot-dip galvanized steel wire having a diameter of 0.120-inch after galvanization. The wire shall be galvanized prior to weaving into the mesh and shall conform to ASTM A 641, Class 3, Finish 5, Soft temper. The minimum tensile strength shall be 60,000 psi when tested in accordance with ASTM A 370. Openings shall be hexagonal in shape and uniform in size measuring not more than 3¼-inches by 4½-inches, approximately 9 square inches. Lacing wire shall be the same Specifications as the wire used in the wire mesh except that its diameter shall be 0.0866-inch after galvanization.

Edges shall be mechanically selvaged in such a manner as to prevent unraveling, and shall develop the full strength of the mesh. The wire used for the selvage shall have a nominal diameter of 0.1535-inch.

#### **9-16.4(3) Wire Rope**

Wire rope shall be ⅝-inch diameter zinc coated steel structural wire rope conforming to the requirements of ASTM A 603, Class A.

#### **9-16.4(4) Hardware**

All rings shall be drop-forged steel, heat treated after forging. Lightweight wire rope thimbles weighing approximately 13.8 pounds per hundred shall be used with the ½-inch diameter wire rope. Wire rope clips may be drop-forged steel or cast steel for use with ½-inch wire rope. All rings, thimbles, wire rope clips, and U-bolts shall be galvanized in accordance with AASHTO M 232, Class C, except castings shall be Class A, and forgings shall be Class B.

#### **9-16.4(5) Hog Rings and Tie Wire**

Hog ring fasteners and tie wire shall be manufactured of 9 gauge steel wire meeting Federal Specification QQ-W-461 (AISI numbers 1010 and 1015) finish 5; medium hardness and tensile strength; Class 3 coating.

#### **9-16.4(6) Grout**

When required, grout for anchors shall consist of one part Portland cement and three parts of clean sand. The Portland cement shall conform to the requirements of Section 9-01.2(1).

#### **9-16.4(7) Anchor Rods**

Anchor rods shall be of good quality steel. The eye may be drop forged or formed with a full penetration weld and shall develop 100 percent of the rod strength. The anchor rod shall be galvanized in accordance with ASTM A 153.

#### **9-16.5 Vacant**

#### **9-16.6 Glare Screen**



**9-16.6(1) General**

All material used in the construction of the fence shall be new. Iron or steel material shall be galvanized or aluminum coated as specified. Imperfectly galvanized or aluminum coated material, or material upon which serious abrasions of galvanizing or aluminum coating occur, will not be acceptable.

**9-16.6(2) Glare Screen Fabric**

Glare screen fabric shall consist of diamond woven wire mesh. The fabric wire may be 0.148-inch diameter aluminum alloy complying with the Aluminum Association requirements for alloy 6061T94, or it may be 0.148-inch diameter (9 gage) iron or steel wire which shall meet all of the requirements of ASTM A 392 galvanized or A 491 for aluminum coated, except that galvanizing of Type 2 glare screen fabric shall be not less than 0.8 ounce per square foot and shall be done before weaving. Aluminum coating shall be Class II.

Type 1 glare screen mesh size shall be approximately a 1-inch diamond. Type 2 glare screen mesh size shall be a maximum of 3½-inch vertical and 5½-inch horizontal. The design shall permit the slats to be installed in a vertical position as shown in the Plans without distortion of the slats.

**9-16.6(3) Posts**

Line posts for Type 1 glare screen shall be 1.5-inches by 1.875-inches hot-dip galvanized steel H column with a minimum weight of 2.8 pounds per linear foot. Line posts for Type 2 glare screen shall be 1.95-inches by 2.25-inches hot-dip galvanized steel H column with a minimum weight of 4.0 pounds per linear foot, or 2-inch inside diameter hot-dip galvanized steel pipe with a nominal weight of 3.65 pounds per linear foot provided only one type shall be used on any one project.

End, corner, brace, and pull posts shall be 2-inch inside diameter hot-dip galvanized steel pipe with nominal weight of 3.65 pounds per linear foot. Intermediate pull posts (braced line posts) shall be H column as specified for line posts. Brace post sleeves shall be 2½-inch inside diameter hot-dip galvanized steel pipe with nominal weight of 5.79 pounds per linear foot.

The base material for the manufacture of steel pipes used for posts shall conform to the requirements of ASTM A 53, except the weight tolerance on tubular posts shall be applied as provided below. The base material for the manufacture of steel H columns shall meet the requirements of ASTM A 675.

Posts provided for glare screen will have an acceptance tolerance on the weight per linear foot, as specified, equal to plus or minus 5 percent for tubular and H-section posts. This tolerance will apply to each individual post.

All posts, braces, and top rails shall be hot-dip galvanized. They shall have a minimum average of 1.8 ounces zinc coating per square foot of surface area with no individual test being below 1.6 ounces zinc coating per square foot of surface area. In the case of members made from pipe, this area is defined as the total area inside and outside. A sample for computing the average of mass of coating is defined as a 12-inch piece cut from each end of the galvanized member.

**9-16.6(4) Tension Wire**

Top and bottom tension wire shall be 7 gage coil spring steel wire of good commercial quality and shall have a zinc coating averaging 0.8 ounces per square foot of surface area.

**9-16.6(5) Cable**

The tension cable shall be 1/4-inch diameter aluminum coated or hot-dip galvanized, 7 wire strand steel cable conforming to the requirements of ASTM A 474 for aluminum coated or A 475 for galvanized, High-Strength Grade. Galvanizing shall be Class A.

**9-16.6(6) Cable and Tension Wire Attachments**

All tension wire and cable attachments shall be hot-dip galvanized steel conforming to the requirements of AASHTO M 232 unless otherwise specified. Eye bolts shall have either a shoulder or a back-up nut on the eye end and be provided with an eye nut where needed or standard hex nut and lock washer and be 5/8-inch diameter for tension cable and 3/8-inch diameter for tension wire and of sufficient length to fasten to the type of posts used. Where the eye bolt is to be installed through a pipe section, two lead washers and one steel washer shall also be provided. Turnbuckles shall be of the shackle end type, 1/2-inch diameter, with standard take-up of 6-inches and provided with 3/8-inch diameter pins. Thimbles shall be light weight wire rope thimbles for use with 1/4-inch diameter cable. Wire rope clips shall have a U-bolt diameter of 5/16-inch for use with 1/4-inch diameter cable. Anchor shackles shall be 3/8-inch diameter with a minimum distance between eyes of 1 1/16-inches and a pin diameter of 7/16-inch. Seizing shall be 0.032-inch diameter galvanized annealed iron wire.

**9-16.6(7) Slats****9-16.6(7)A Wood Slats**

Wood slats shall be 3/8-inch by 2 3/8-inch by the height designation of the fence. Material shall be finished and treated cedar or redwood and shall be free from loose knots, cracks, and other imperfections. A dimensional tolerance of plus or minus 1/16-inch in width or thickness is allowed provided that the maximum space between slats does not exceed 3/4-inch.

**9-16.6(7)B Plastic Slats**

Plastic slats shall be 3/8-inch by 2 3/8-inch by the height designation of the fence. They shall be manufactured from tubular polyethylene color pigmented material consisting of high density virgin polyethylene and color pigments, designed to retard ultraviolet penetration. The material shall have a minimum wall thickness of 0.0030-inch plus or minus 0.0003-inch and shall remain flexible without distortion and without becoming brittle through a temperature range of -70°F to + 250°F. Tensile strength shall be at least 3,600 psi and the melt index shall not exceed 0.25.

Plastic slats shall be retained in place by means of U-shaped retainer members at the bottom and top of the fence. Retainer members shall be of the same material as the slats.

The color for plastic slats will be approved by the Engineer from samples submitted by the Contractor or supplier.

**9-16.6(8) Fittings**

Fittings shall be malleable cast iron or pressed steel and galvanized in accordance with the requirements of AASHTO M 232.

Fittings for any particular fence shall be those furnished by the manufacturer of the fence.

**9-16.6(9) Fabric Bands and Stretcher Bars**

Fabric bands shall be  $\frac{1}{8}$ -inch by 1-inch nominal and stretcher bars  $\frac{3}{16}$ -inch by  $\frac{3}{4}$ -inch nominal. Nominal shall be construed to be the area of the cross section of the shape obtained by multiplying the specified width by thickness. A variation of minus 5 percent from this theoretical area shall be construed as “nominal” size. Both shall be hot-dip galvanized to meet the requirements of ASTM F 626.

**9-16.6(10) Tie Wire**

Tie wire shall be 9 gage aluminum wire complying with the ASTM B 211 for alloy 1100 H14 or 9 gage galvanized wire meeting the requirements of AASHTO M 279. Galvanizing shall be Class 1.

**9-16.7 Vacant****9-16.8 Weathering Steel Beam Guardrail****9-16.8(1) Rail and Hardware**

Steel for rail elements and terminal sections shall conform to ASTM A 606 or ASTM A 607. Bolts, nuts, and washers for installation of weathering steel shall meet the requirements of Section 9-16.3(4), and be galvanized in accordance with Section 9-16.3(3). If required, 6-inch channels and fittings shall conform to ASTM A 242. In addition, all steel for the guardrail components shall conform to one of the following chemical compositions, percent (ladle):

<b>Composition</b>									
	<b>C</b>	<b>Mn</b>	<b>P</b>	<b>S</b>	<b>Si</b>	<b>Cu</b>	<b>Cr</b>	<b>Ni</b>	<b>Zr</b>
	0.12	0.20	0.07	0.05	0.25	0.25	0.30	0.65	
No. 1	Max.	to 0.50	to 0.15	Max.	to 0.75	to 0.55	to 1.25	Max.	
	0.12	0.50	0.12	0.05	0.20	0.50	0.40	1.00	0.10
No. 2	Max.	to 1.00	Max.	Max.	to 0.90	Max.	to 1.00	Max.	Max.

Blast cleaning or pickling to remove mill scale will not be required. All fabricated steel parts shall be handled with care to avoid gouges, scratches, and dents. The steel shall be kept clean of all foreign material, such as paint, grease, oil, chalk marks, crayon marks, concrete spatter, or other deleterious substances. Natural oxidation of the steel will not be considered foreign material. Storage in transit, in open cars and trucks, for an extended period will not be permitted. Steel parts stored outside in yards or at job sites shall be positioned to allow free drainage and air circulation.

**9-16.8(2) Anchors**

Guardrail anchors may either be furnished as provided in Section 9-16.3(5) or they may be nongalvanized and fabricated from steel conforming to ASTM A 242 with the exception that all Type 1 anchors shall have galvanized cable and fittings as specified in Section 9-16.3(5).